

Role of Preventive Medicine in Reduction of Infant and Perinatal Mortality

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ALTHOUGH the infant and perinatal mortality rate is no longer as sensitive an index of socioeconomic conditions in the United States as it was several decades ago, it still reflects important gradients in the population relating to environmental factors and to the availability and quality of medical care. "Whatever the balance of factors contributing to an area's standard of maternal and child health, the interrelationships of social, cultural, psychological, and biological influences would seem to be paramount" (1).

Maternity care in the narrower sense consists in the care of the pregnant woman, her safe delivery, her post-natal examination, the care of her newly born infant, and the maintenance of lactation. The object is to ensure that every expectant and nursing mother maintains her health, learns the art of child care, has a normal delivery, and bears healthy children. In the wider sense, it begins much earlier in measures aimed to promote the health and well-being of the young people who are potential parents, and to help them to develop the right approach to family life and to the place of the family in the community (2).

Increasingly, maternity care includes guidance in parent-craft and help with infertility and family planning. Health supervision of the adolescent girl, which is designed to establish optimal health for prospective mothers, is an important feature of this broad medical responsibility. In adolescence, people establish the habits and attitudes which may remain for the rest of their lives and be passed on to future generations. Poor nutrition and dietary habits

during the younger years undoubtedly affect the mature physique, lead to reduced stamina, predispose to infection, and portend poorly for future capability to bear a healthy child.

The delinquent teenager and the unwed adolescent mother represent groups deserving special consideration in community-centered health programing. A diverse and complicated array of programs is developing to implement these broader objectives of maternity care (3). In establishing these programs, cognizance must be taken of population shifts to and from the

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great cities, the migratory status of certain underprivileged groups, the rise in the number of infants born out of wedlock, the declining ratio of physicians to population, and the increasing demands for facilities and manpower for all types of specialized medical care for high-risk groups (4).

Among the many factors associated with variations in perinatal mortality are differences in the quantity, quality, and timing of preconception care and obstetrical care within the matrix of nutritional, educational, and other circumstances reflecting the social and economic levels of a community. Poor social conditions rarely occur in isolation; physical disadvantages coexist with environmental and cultural handicaps. The mechanisms, however, by which social factors are translated into biological events cannot be tested easily. Also, clear-cut statistical support is not always available for the associations cited in this section and in subsequent sections of the paper.

There have been few opportunities to study the whole child-bearing history of groups of women in order to relate events of one pregnancy with those of another. Nevertheless, in attempting to define the parameters which characterize the vulnerable groups of women demonstrating disproportionate perinatal wastage, several interrelated factors stand out. Handicaps adversely affecting child-bearing potential include pregnancies at a very young age or at an advanced age, pregnancies out of wedlock, a poor obstetrical history, low socioeconomic status, poor habits of medical care, heavy work, prolonged periods of attempted conception, impaired maternal health, poor nutrition, endocrine imbalance, blood incompatibilities between mother and fetus, and anatomic defects of the generative tract.

Many of the same factors operate in fatal and nonfatal perinatal events. The fetal outcome depends upon the type, degree, and duration of environmental insults in utero. Just as early or late fetal mortality, premature birth, congenital anomalies, and neonatal mortality can be the result of serious complications affecting the fetus, so can neonatal morbidity and an aftermath of sublethal brain injury, cerebral palsy, epilepsy, mental retardation, disabilities of speech, hearing, and learning, and emotional

and social maladjustments be the result of these same factors operating under less severe circumstances.

Obstetrical Practices

The modern obstetrical approach to perinatal salvage rests on the basic premise that the fetus is a victim not only of its genetic constitution but also of its maternal and uterine environment and that in most instances a favorable alteration of this environment, either before conception or during pregnancy, will have a salutary influence upon fetal and neonatal welfare. Such preventive care would logically begin before marriage, during adolescence. The general physician should be a key figure in providing such care, since the obstetrician may not see the patient until after she is pregnant and her medical difficulties, emotional maladjustments, and poor social habits are entrenched.

Ordinarily, the primary responsibility of the practicing obstetrician is to the individual patients in his practice, rather than to the community as a whole. Yet even within this area of responsibility, he must choose how to direct his efforts and must place greater emphasis upon the patients who are at increased risk of disease or disability. Moreover, he needs to be familiar with, and support, the total health resources within his community if he is to serve as a fixed point of information and referral for his patients and bring them a continuity of expert care.

Investigation and care of high-risk obstetrical patients is a complicated medical undertaking requiring specialized knowledge and elaborate laboratory facilities and technical personnel. Obviously, full cooperation from medical workers in the multiple disciplines will be necessary to provide comprehensive care for vulnerable groups.

Generative tract dysfunctions, which include inefficiency in pregnancy, may be the first clinical manifestation of a serious disorder at a site far removed from the pelvis and the reproductive organs. Clinical assessments designed to detect such difficulties should therefore be an integral part of maternal and child health programming. In some cases, a specific medical, anatomic, or pathological disorder is readily discernible. Often, however, the cause is not ob-

vious immediately because the defect is sub-clinical. Foremost examples are certain subtle endocrine, metabolic, nutritional, and emotional disorders.

Biochemical, molecular, and hormonal alterations cause various complications of pregnancy and of child health; other complications relate to emotional, cultural, social, and environmental influences. These deviations from the norm justify placing the patients evidencing them in a vulnerable or high-risk group and constitute a legitimate basis for instituting intensive work-up and continuing care and supervision in order to improve the patients' childbearing potential. Thus, in the broadest sense, obstetrical care becomes the responsibility of many physicians and workers in the health field. All women need to be prepared for their childbearing responsibilities, but the physician of the high-risk patient must also offer her continuous medical supervision and help her select the optimal time for conception.

Evaluations Before Conception

The relationship of the endometrium and the decidua to the formation of the chorion is important in determining the type of placenta that will develop. Underdevelopment or gross deformation of the placenta or complications of its location or attachment, as well as abortion and premature birth, may be caused by faulty placentation and an impaired intrauterine environment. Thus, before the poor-risk patient conceives, an evaluation of the progestational development of her endometrium is advisable, in addition to a general screening for primary defects which might interfere with proper ovarian function.

Specific therapeutic measures are best employed before conception, since nutritional support of the developing ovum and trophoblast in the very beginning of pregnancy is crucial. Followup treatment and careful evaluations during early gestation are likewise required, since adjustments in therapy may be necessary. For example, a need for additional thyroid support may become apparent, or the insulin requirements of a diabetic patient may change dramatically. Moreover, under the stresses of pregnancy (augmented metabolic demands, increased protein binding of active hormones, al-

tered hemodynamics, and so forth), some women who are normal in the nongravid state may develop a diabetic condition, hypothyroidism, anemia, cardiac dysfunctions, or other disorders during critical periods of gestation. Hence, during pregnancy, obstetrical patients—especially those considered at risk—should be screened for these complications even though no evidence of such complications was apparent in the preconception workup.

During the early weeks of pregnancy, the obstetrician of the high-risk patient should determine the growth pattern of the uterus. He can estimate the viability of the placenta by noting the character of the cervical mucus, determining the predominant cell type in the vaginal smear, and discovering the amount of urinary excretion of certain hormones (5). Presence of a thick tenacious mucus which crystallizes may indicate a lack of sufficient progesterone secretion to support pregnancy. In this event, cells of the vaginal smear may be highly cornified (an estrogenic effect, indicating that the progestational domination needed in pregnancy has been lost). A marked reduction in the excretion of urinary estriol, pregnanediol, and chorionic gonadotrophin likewise may forecast impending difficulties. Bleeding or uterine cramps are indications for enforced bed rest. Progesterone, whose principal value is to give support to the endometrium before conception, may be administered upon evidence that the pregnancy is compromised, but its benefits at this late stage have not been proved.

Prevention of Premature Birth

The relationship of birth weight to perinatal mortality, morbidity, and the remote sequelae of neurological deficits is one of the most important associations observed in any assessment of inefficiency in pregnancy. Among infants weighing 2,500 grams or less at birth, 174 in 1,000 die within 4 weeks after birth, contrasted with a rate of 7.8 for all other infants (6).

These losses need to be considered against the background of the optimal clinical practices which can be brought to bear on this problem. To a substantial degree, the particulars of patient management are arbitrary, or even pragmatic, and vary from one locale to another. Although broad principles can be outlined with

respect to clinical approaches to the major obstetrical complications, the reader must indulge the authors to some extent where personal bias colors the choices of treatment.

Prenatal supervision. Careful prenatal supervision of pregnant patients with certain diseases often entails several hospital admissions for evaluation, rest, control, and appropriate therapy. In many cases of chronic infection (especially of the urinary tract), hypertensive diseases, cardiac disease, diabetes mellitus, or other chronic conditions, hospitalization and the institution of proper control measures will prevent the onset of premature labor. Meticulous prenatal care minimizes the risk of toxemia and placental abruption, which are common causes of premature labor and reasons for therapeutic intervention at an early stage in the pregnancy. The newer medical and surgical techniques available to the physician today enable him to arrest more tuberculous lesions than formerly and to salvage more pregnancies of patients with tuberculosis than ever before. An interruption of pregnancy because of this disease is rarely indicated. Indeed, the current trend is to avoid obstetrical intervention for most of the medical and surgical conditions that complicate pregnancy.

Supervised bed rest. Uterine hyperirritability is common in a variety of medical and obstetrical conditions, including toxemia, bleeding in association with placental complications, certain maternal infections, polyhydramnios, fetal malpresentation, uterine tumor or maldevelopment, and multiple gestation. Increased uterine tone often antecedes onset of premature labor by several days or weeks, and adequate bed rest, which reduces muscle tone and improves uteroplacental circulation, is desirable prophylaxis in conjunction with more specific therapy. Serial determinations of the cyto-hormonal characteristics and hormonal excretion patterns, particularly of chorionic gonadotrophin, pregnanediol, and estriol, may be of prognostic value in estimating placental sufficiency and fetal welfare.

Urinary tract infections. Asymptomatic bacteriuria can be demonstrated in about 5 to 8 percent of normal pregnant women, and during the puerperium the prevalence is even higher. Although pathogenic organisms in the urine

do not necessarily portend trouble, patients harboring them clearly exhibit a significantly increased susceptibility to acute urinary tract infection. In addition, Kass (7) has called attention to the association between asymptomatic bacteriuria and increased perinatal mortality, an increase due for the most part to a higher frequency of premature birth. The lower urinary and generative tracts are closely related so that, through elaborate neurological, vascular, and lymphatic connections, the functions and reactions of one may influence the other.

Surgical therapy. In adenomatous goiter with hyperthyroidism, a partial thyroidectomy and treatment with a variety of antithyroid agents will enable a pregnant woman to complete her pregnancy with reasonable expectancy of having healthy and normal, living offspring. Other surgical procedures also can be performed, preferably in the second trimester, without jeopardizing a pregnancy. Surgical removal of ovarian tumors and the occasional myomectomy that is indicated during pregnancy should be done at this stage to minimize the risk of abortion or premature labor. Ideally, of course, such surgery would have been carried out before conception as a measure to enhance the chance of a good perinatal outcome in any future pregnancy.

The preliminary workup should be adequate enough to exclude the possibility that certain other defects will contribute to late abortion. Plastic surgery may improve the obstetrical prognosis for some patients with a history of habitual or recurrent premature labor, especially when endocrine deficiencies and other possible causes of premature labor have been excluded. Correction of a septate or bicornis uterus may offer such an opportunity for improvement. Selected patients who have experienced repeated midtrimester abortions and who have an incompetent internal cervical os may benefit from surgical closure of the cervix at about midpregnancy. (Usually a snug suture or strip of synthetic material is placed submucosally around the circumference of the cervix near the level of the internal os.)

Smoking habits. Recently, heavy cigarette smoking has been incriminated as a possible cause of lower than normal birth weight.

Simpson (8), Lowe (9), and Frazier (10) have noted that fetuses of smoking mothers are, on the average, smaller than those of nonsmokers and that this reduction in birth weight seems to be unrelated to maternal weight, age, parity, or complications of pregnancy. While the evidence is still inconclusive and in dispute, the wisest policy is to discourage heavy smoking during pregnancy, particularly among patients at risk.

Abortogenic infections. Maternal syphilis is the classic abortogenic infection, but the possible role of *Listeria monocytogenes* in human fetal death and premature birth has aroused more interest recently. A causal relationship has been clearly established in animals. Although the presence of *Listeria* has been definitely demonstrated in aborted tissues of women, the magnitude of this cause of fetal wastage is unknown at present. Rappaport and associates (11) isolated these organisms from the vaginal flora of 25 of 34 women with a history of repeated abortion and premature birth. The organisms can be eradicated with sulfonamide.

Third trimester bleeding. A policy of expectant management in carefully selected cases of placenta previa may have real advantages in terms of improved maternal and perinatal salvage. Unfortunately, however, only about one-quarter of the patients with placenta previa can be given this conservative care for the desired period. Labor or bleeding before term necessitates the examination and delivery of the great majority by the most appropriate means, often despite the immaturity of the fetus (12).

Prevention of Hypoxia, Trauma, and Narcosis

In fetal anoxia resulting from interference with the passage of oxygen from mother to fetus, the commonest cause is abruptio placentae (13). The prognosis depends in large measure upon the severity of the disruption, whether or not there is associated toxemia, the number of hours necessary to accomplish delivery, the degree of maternal shock, and the stage of pregnancy. Early diagnosis and timely intervention to effect delivery by the most conservative procedure possible may spare the fetus an anoxic death. In some cases, the most conservative procedure will be abdominal delivery.

When the fetus is subjected to anoxia from unpreventable complications affecting the mother, the primary objective in obstetrical management should be avoidance of multiple insults to the fetal respiratory center. Analgesic and systemic anesthetic agents should be used sparingly during labor to avoid depression of the fetal respiratory center at birth. Narcosis of the mother is preferably avoided altogether in managing premature labor, since the immature infant is particularly vulnerable to depressants of the central nervous system. Trauma must also be meticulously prevented.

Refinements in the mechanical aspects of obstetrics and emphasis on conservative approaches have been credited in large measure for the significant downward trend in perinatal mortality observed in the United States during the 1940's. These approaches include the choice of cesarean section over difficult vaginal deliveries and the elimination of high forceps deliveries, as well as avoidance for the most part of versions and extractions. Better evaluation of the pelvis and judicious use of pitocin stimulation and cesarean section have kept the proportion of difficult midforceps operations low. Wider use of cesarean section in management of fetal malpresentation and prolapsed cord has reduced birth injury from hypoxia and trauma. The possibility of nonfatal, as well as fatal, effects from these insults has contributed to a growing belief that wider use of cesarean section in the interest of the fetus is a wise practice. Broadening the number of fetal indications for cesarean section will permit optimal fetal salvage, and at the same time a rate for all abdominal interventions of about 5 percent can be maintained.

A special word of caution should be expressed concerning the real hazards of unwarranted premature intervention in cases of elective repeat cesarean section. In the extreme, severe neonatal respiratory distress may be encountered in infants of low birth weight, or there may be central nervous system defects resulting from immaturity and complications of anesthesia or surgery. When doubt exists about the duration of pregnancy or the maturity of the fetus, abdominal delivery should be deferred until the onset of labor.

Maternal Isoimmunization

Although Rh isoimmunization accounts for the vast majority of erythroblastotic infants, a small minority may be caused by ABO blood factors and a wide variety of relatively rare incompatibilities. Rh positive mothers who have given birth to an affected infant should be subjected to a broad immunological screen in an attempt to identify the incompatible factor. The increase in occurrences of drug-induced fetal red cell hemolysis is of vital concern to the obstetrician, who must choose therapeutic agents wisely in combating the infections encountered during pregnancy. Treatment with sulfonamides, as well as with the salicylates, is particularly worrisome because these drugs compete with bilirubin for protein-binding sites. Since the unbound bilirubin cannot be excreted in the fetal urine or bile, the free (indirect) moiety is available to be bound by the tissue proteins. Especially active in absorbing this bilirubin are the basal nuclei in the fetal brain, where there seems to be a predilection for deposition of bilirubin. Asphyxia and very low blood sugar levels apparently predispose a patient to concentration of bilirubin in the brain.

Prevention of erythroblastosis fetalis has been successful only to a limited extent, since early delivery is the only practicable means at present of obviating fetal insult. Reasonably certain evidence of homozygosity of the husband and, especially, a previous history of birth of an infant with documented hemolytic disease to a sensitized mother are factors to consider in selecting patients for early delivery. Although choosing the optimal time for intervention requires nice judgment, delivery before the 36th week is seldom justifiable. Recently, clinical policy has been to perform an amniocentesis at appropriate intervals to test the amniotic fluid for bilirubin spectrophotometrically. Performance of this objective laboratory determination on women who have demonstrated a rise in the albumen antibody titer may assist in selecting those who should have labor induced.

To minimize the risk of kernicterus, particularly in an immature infant, the blood must be appropriately exchange-transfused soon after birth and the procedure repeated as necessary. Successful transfusions of the fetus in

utero have been achieved recently by injecting type O negative blood through the uterine wall directly into the abdominal cavity of the fetus. This technique, which attempts to sustain the fetus until reasonable maturity, as well as the administration of gamma globulin to the mother in the postpartal period to suppress specific immunological responses to fetal Rh positive cells, offers considerable hope for the future in combating perinatal losses due to hemolytic disease (14-16).

Management of the Diabetic Mother

The optimal time for delivery of the diabetic patient seems to be about 18 to 24 days before the expected confinement. A decision to deliver a patient earlier than this should be based on special indications, since fetal immaturity with its high incidence of respiratory distress imposes a grave neonatal hazard. Thus, intervention before the 37th week is justified only when (a) a pregnancy is complicated by acute toxemia, (b) repeated bouts of acidosis occur despite intensive medical care, (c) a severely edematous fetus is visualized on X-ray, (d) hydramnios is developing, or (e) the patient has previously experienced a fetal death in utero before the 37th gestational week. The method of delivery is chosen in accordance with the obstetrical situation. In general, however, the choice between induction of labor and cesarean section is made on the basis of the anticipated ease of labor and delivery at the time that delivery is deemed advisable.

When a pregnant woman is diabetic, the likelihood of perinatal mortality is usually directly related to the degree of vascular damage she has experienced. Occurrence of maternal toxemia, keto-acidosis, infection, and hydramnios, however, decrease significantly the chances of fetal survival; as do fetal macrosomia and traumatic delivery. Meticulous prenatal supervision, strict control of the metabolic disorder, the avoidance of infection, of acidosis, and of toxemia, and the institution of proper rest regimens are imperative.

Class A diabetics (those exhibiting only laboratory evidence of the metabolic disorder) subject their infants to the same special hazards as encountered by infants of parents with the clinical disease. These hazards include the

respiratory distress syndrome, hypoxia, physiological immaturity, macrosomia, the risk of fetal death in utero, and neonatal hypoglycemia. Thus, determination of glucose metabolism in suspect cases becomes an integral part of prenatal care. Obstetrical patients who have a family history of diabetes, have previously experienced a fetal death, have had excessively sized fetuses, hydramnios, or a malformed fetus, or have exhibited glycosuria during pregnancy should be routinely screened for a metabolic disorder even if it is not possible to do so in all patients at risk.

Prevention of Toxemias of Pregnancy

The toll in perinatal mortality taken by the toxemias of pregnancy can largely be prevented by meticulous prenatal supervision and correction of water retention and excessive weight gain before the classic signs of toxemia develop. Finger edema, excessive weight gain before the 30th gestational week, and infraorbital blanching may be signs of the prehypertensive phase. Almost without exception, premonitory signs indicative of pre-eclampsia precede the onset of eclampsia, although at times these signs are subtle and difficult to elicit. Screening of all pregnant women for danger signals is important, but certainly those predisposed to toxemia need intensive supervision if they are to be spared this complication. Patients whose pregnancies are complicated by hypertensive cardiovascular disease, impaired renal function, cardiomegaly, previous cerebral hemorrhage, obesity, diabetes, multiple pregnancy, and hydramnios fall into this high-risk group.

The timing of medical intervention is crucial, since premature manipulation of the patient before the acute condition has been brought under adequate control may precipitate convulsions. On the other hand, temporizing may give rise to deterioration in the patient's condition, with substantial risk of eclampsia, placental abruption, and fetal death. Procrastination in the hope of gaining time for additional growth of the fetus is a common error. Once the acute process is stabilized, delivery by the most expeditious, atraumatic means possible—at times, by abdominal intervention—will best serve the interest of the fetus, as well as of the mother.

In pregnant patients with markedly elevated

blood pressures, the administration of magnesium sulfate, either intravenously or intramuscularly, as anticonvulsant therapy and the use of vasodilator drugs to minimize the risk of intracranial hemorrhage have reduced the need for heavy sedation during the period of medical stabilization. Strict control measures to prevent convulsions must be continued into the postpartal period, at least until improvement in the clinical condition is obvious and diuresis has occurred. Common mistakes at this stage are failing to correct hemocentration and not maintaining the electrolyte and water balance.

Perinatal Deaths Related to Malformation

In attempting to mitigate losses and permanent afflictions associated with congenital anomalies, certain preventive, diagnostic, and therapeutic steps appear to fall within the realm of obstetrical responsibility. A careful medical, genetic, and family history will often alert the clinician to an increased risk of a malformed fetus. Thus, he may be prepared to recognize defects early, some of which may be amenable to surgical correction or to control by appropriate medical treatment.

As a general prophylaxis, the obstetrician may institute preconception care designed to prevent a faulty nidational environment and to provide a continuity of medical-obstetrical care, particularly among vulnerable groups. He should also curtail irradiation of his obstetrical patients, especially during the first trimester, to the lowest limits compatible with safe management of pregnancy, labor, and delivery. Drug administration at the crucial time of fetal organogenesis should be selected wisely and administered strictly upon indications since a growing list of potential teratogens has been identified (17).

Indications for Stimulating Labor

Injudicious use of oxytocic stimulation or the administration of it without appropriate safeguards and supervision may seriously jeopardize the fetus. Full knowledge of the individual obstetrical situation is a prerequisite to safe use of this technique. Constant observation of the patient during administration of this treatment is imperative. The increasing use of uterine stimulation as an adjunct in elective in-

duction of labor is a cause for concern. Use of oxytocin in cases of slow labor (not true inertia) and in cases of dyskinetic or hypertonic labor should be avoided. Occasionally, the result may be initiation of tetanic contractions, reduction of the uteroplacental blood flow, impaired fetal oxygenation, and induction of precipitous labor with its ensuing stresses upon the fetal head. Current knowledge of the etiology of the nonfatal conditions of perinatal wastage—cerebral palsy, epilepsy, and mental retardation—has incriminated even minor degrees of intrauterine hypoxia. Nevertheless, oxytocic stimulation in properly selected cases, administered in accordance with acknowledged safeguards and under meticulous supervision, may offer the fetus its best chance of survival. Moreover, in these circumstances, uterine stimulation may afford the best prognosis for the mother and the fetus with the least amount of operative interference.

Postmature Fetus

Fetal inanition, dysmaturity, and hypoxia in association with impaired placental function are sometimes encountered in postdate pregnancies, but similar conditions are also noted in infants when the uteroplacental blood flow has been impaired from any cause, for example, from chronic hypertensive cardiovascular disease or toxemia. Selection of the optimal time for interference depends upon the whole clinical picture. If there is no clinical or laboratory evidence of placental dysfunction and if hypertension does not complicate the case, a postdate pregnancy should be allowed to continue. During parturition, however, it is advisable to anticipate certain difficulties in labor, particularly inertia, which need to be treated as they appear (18).

Premature Rupture of Membranes

Fetal infection becomes a major perinatal risk if the membranes are ruptured, particularly if desultory labor follows. The fetal infection that may result usually takes the form of pneumonia, but sometimes it develops as a general sepsis. If the membranes have been prematurely ruptured for more than a few hours, broad-spectrum antibiotic therapy, which

might be expected to be effective against both gram-negative and gram-positive organisms, should be administered to the mother at the onset of labor to help minimize infection. Should the fetus become hypoxic in utero, the fetus may inspire infected amniotic fluid, meconium, squama, and debris. The subsequent development of the respiratory distress syndrome and of pneumonia will seriously compromise the outlook for the infant in the immediate neonatal period. Such hazards make expert care of the newborn imperative. To avoid these hazards, labor may need to be induced in appropriate cases when the rupture occurs at or near term and the obstetrical situation is favorable. When feasible, it is desirable to accomplish delivery within 24 hours of membrane rupture.

Pediatric Practice

Immediate Care of Newborn

Emphasis on the obstetrical procedures and preventive measures that can be undertaken in premature birth should not be taken to mean that good pediatric care will not improve neonatal salvage. The ultimate prognosis for the newborn infant during the ensuing days, months, and years of his life largely depends, however, upon the effectiveness of management during the critical minutes following birth. The significant immediate desiderata for the child are a clean airway, oxygen, warmth, and as little handling as possible.

In the presence of anoxia, apnea neonatorum will respond only to correction of the anoxia itself. Intratracheal aspiration is required when apnea occurs secondarily to obstruction and this is best carried out under direct vision with the laryngoscope. In primary apnea, the lungs can be expanded by intermittent positive pressure after the possibility of obstruction has been eliminated. Gastric lavage may be carried out in infants delivered by cesarean section and those born to diabetic mothers. Anoxic infants should be generally supported by maintaining temperature and humidity. They are in a state of vascular collapse and need to be treated like other patients in shock. Antibiotics may be administered to minimize the dan-

gers of pneumonia if maternal complications suggest the possibility of infection. Following resuscitation, the infant should be placed in an incubator with oxygen not exceeding 40 percent; an oximeter should be used to assure low levels of oxygen concentration. Water and electrolyte balance need to be established and maintained at optimal levels. Glucose administrations may be required in special circumstances.

For premature infants, the precise environmental requirements remain controversial in spite of extensive research. Proper emphasis needs to be given to temperature, humidity, oxygen, electrolytes, nutrition, water balance, chemotherapy, and the like, particularly for infants with the respiratory distress syndrome. These matters are complex, and elaborate facilities, trained personnel, and constant supervision of the infants are a necessity. There is a trend toward early feeding of the premature, but this practice, too, remains controversial since the type, timing, and route of administration of the feeding depend on the individual case.

The frequency distribution of birth weights at any given gestational age spans a wide weight range (19). High-risk babies include not only those of low birth weight regardless of gestational age but also those whose birth weight exceeds that expected for the week of gestation. It is wise policy to observe and care for these infants as if they were premature.

The Erythroblastotic Infant

Expert pediatric management is required for the erythroblastotic infant, as well as facilities and personnel to perform an immediate exchange-transfusion and to repeat it as necessary. Such care is particularly important in the management of premature infants, who are especially predisposed to developing kernicterus. Jaundice can be controlled and brain damage minimized or prevented by exchange transfusions soon after birth. Efforts should be exerted to keep the serum bilirubin at the lowest possible level. Infants subjected to intrauterine hypoxic injury are particularly susceptible to kernicterus and must be given special consideration in therapy.

Metabolic Disorders

Phenylketonuria. Phenylalanine, an essential amino acid, accumulates in the blood of the phenylketonuric infant and damages the brain unless a special diet is instituted at an early age. The condition occurs about once in 15,000 births. It is the cause of mental retardation in about 1 percent of institutionalized mentally retarded persons in the United States. Special tests are available for routine screening of newborn infants for this defect.

Other mutant disorders. The absence of homogentisic acid oxidase characterizes one of the genetically determined metabolic diseases in man. It is caused by a simple, but rare, recessive autosomal gene. In the resulting alkaptonuria, the child's urine turns dark on standing and stains clothing. Galactosemia is another molecular disease in which a metabolic molecule—galactose-1-phosphate uridyl transferase—is manufactured imperfectly or is absent. Without the enzyme, galactose accumulates, and the child usually dies or becomes mentally deficient or physically handicapped if he is not put on a milk-free diet.

Sickle cell anemia and thalassemia are two of the best illustrations of the importance of genetic factors in metabolic disease. Deficiency of the antihemophilic factor, which is needed to maintain hemostasis, may also be due to a gene—a dominant autosomal one—transmitted from father to son.

A complete catalog of mutant metabolic diseases would be long. Those mentioned show that genetic assessment must be an integral part of every evaluation of the newborn and genetic counseling a part of prenatal care.

Chromosomal disorders. A host of anomalies of the chromosomes have been identified, including abnormal counts, nondisjunction, translocation, and mosaicism. The possible far-reaching ill effects of these disorders emphasize the necessity for adequate facilities and trained personnel to evaluate these anomalies (20). Trisomy of the autosomes, for example, is responsible for a number of pathological conditions, and often probably for intrauterine death, depending on which autosomes are involved. Mongolism, mental retardation, and

related disorders result from such genetic deviations.

Clinical Services for the Newborn

Any population of newborn infants manifest a number of transient and permanent pathological conditions. Some of those arising from congenital malformations are defined as abnormalities of structure attributable to faulty development. Many of them are not recognizable at birth but develop later. Sexual deviations, for example, may not become apparent until puberty. Malformations differ in severity from invariably fatal conditions, such as anencephalia, to trivial conditions of only academic interest.

Facilities need to be expanded for the prospective study, followup, and care of infants with unusual chromosomal characteristics and those who have been subjected to some degree of insult during the perinatal period. Such insults are heterogenic and call for comprehensive evaluation and study. The permeability of the placenta to most analgesic, anesthetic, and therapeutic drugs requires constant surveillance of pharmacological reactions in the newborn. Passage of certain drugs through the placenta may have profound teratogenic effects upon the fetus, as the recent tragic results of thalidomide therapy have demonstrated. Other drugs may interfere with tissue oxygenation (for example, chloramphenicol). In addition, certain commonplace treatments, such as use of diuretic drugs to control edema, may impose the dangers of acidosis and hypokalemia on a pregnant woman if administration is prolonged beyond a short course. Such biochemical derangements may cause a shift to the right of the fetal oxygenation curve and thus interfere with the accommodations of the fetus to its oxygen environment.

Research and Clinical Practices

Basic and applied research has profoundly influenced the standards of medical care as well as the character of clinical practices. The impact of future research investigations promises to be even greater. The relatively stationary trend in perinatal mortality in the United States during the past decade has been the impetus

for gaining new insights into ways to start it downward. To bring about a better understanding of perinatal wastage, representatives of a variety of viewpoints and disciplines are conducting investigations into epidemiologic, as well as biological, factors. Laboratory scientists have also contributed to certain basic understandings through studies of comparative reproductive biology, genetics, and utero-placental-fetal physiology. Already many scientific explorations of the intrauterine environment have been translated into practical techniques for clinical practice.

Recent advances in medical technology and instrumentation, including fetal electrocardiography and phonocardiography, electromagnetic flow meters, polarographic cathodes for measuring tissue oxygen tensions, and manometric and highly sensitive electrical recording devices for measuring intrauterine and myometrial pressures and contraction patterns, have exposed the fetus and its environment to a host of direct investigations. These studies form the basis for much of our present understanding of fetal and uteroplacental physiology in normal and abnormal obstetrical situations. Knowledge has rapidly accumulated on hormonal determinations, interactions and functions of the biosynthetic pathways of ovarian and placental steroids, hypothalamic control of the pituitary-ovarian axis, cytohormonal assessments, tissue steroid analyses (gas chromatography), tissue electrolyte activity, enzymology, cytogenetics, and immunochemistry. This knowledge has helped particularly in providing answers to some of the fundamental questions encountered in obstetrical and pediatric practice.

Contemporary basic and clinical research are interdependent. A thorough understanding of the fundamental mechanisms of the generative tract is needed if the conditions responsible for the largest segments of perinatal losses are to be avoided. One goal in many investigations of the fetal environment will be, for example, to discover safe therapeutic agents capable of protecting the fetus in the variety of clinical situations in which the uteroplacental blood flow is markedly impaired. To a much greater extent than ever before, clinical concepts and practices rest upon a scientific base. Moreover, practical

applications of new knowledge can often be quickly incorporated into community health service programs, such as screening for phenylketonuria.

Conclusion

A high quality of obstetrical and pediatric care is needed to maintain the current rates of infant and perinatal survival. Further reductions in perinatal mortality and morbidity await the results of the coordinated efforts of medical workers in many disciplines. Some of the anticipated results may, in turn, be adapted to the practice of preventive medicine on a wide scale at the community level and be reflected in further general improvement in the survival and health experience of young infants.

Summary

The relatively stationary perinatal mortality rates in the United States during the past decade or more emphasize dramatically the need for broadening and intensifying the medical care of females and for providing such care on a continuing basis. Care should preferably begin in childhood, or at least at pubescence, so that groups at high risk in pregnancy and at childbirth may be identified and given intelligent workups and therapy and pregnancies can be planned in relation to the health status of the prospective mother.

Traditional patterns of prenatal care and care of the newborn need to be reorganized and elevated. The total medical resources of the community need to be rallied by bringing together all maternal and child health workers in an effective way so that broad service programs can be established in line with the changing patterns of American life. Professional and lay education must be intensified to assure successful implementation of such community-wide programs and an equal opportunity for successful childbearing among all segments of the population.

Wider dissemination of what is now known about maternity care and care of the newborn, the rapid monitoring of vital records to detect

events at variance with the anticipated, and prompt translation of new knowledge into applied service programs are essential features of this intensified effort to break the stalemate which has arisen in the fight against reproductive waste.

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Education Notes

Management in Community Health Agencies.

Three short-term courses designed to help health practitioners improve their competence in planning and providing community health services are being offered to eligible personnel of voluntary, official, and professional health agencies and organizations during September and October 1966. The courses, sponsored by the National Health Council, will be conducted in cooperation with selected universities.

- Successful Patterns for Executive Action is to be given at the University of California School of Public Health, September 6-11.

- The Practice of Management in Community Health Agencies will be presented at the Boston University Metropolitan College, September 18-23.

- The Executive Process in Community Health Administration will be offered at the University of North Carolina School of Public Health, October 9-14.

A few Public Health Service traineeships (tuition stipends) are available for each course. Additional information can be obtained from Miss Wilma D. Henry, Director, Continuing Education Program, National Health Council, 1790 Broadway, New York, N.Y. 10019.

Institute for Environmental Health Studies.

The University of North Carolina has established an institute to improve the preparation of postgraduate students planning careers in teaching, research, and professional practice in fields related to environmental health.

The institute is interdepartmental and interdisciplinary. Units of the university marshalled in its program are the departments of biostatistics, en-

vironmental sciences and engineering, and epidemiology of the school of public health; the departments of botany, chemistry, city and regional planning, geology, and zoology of the college of arts and sciences; the school of medicine; and the department of food science at North Carolina State University, Raleigh.

A \$3.8 million Public Health Service grant to be allocated over a 5-year period supports the institute.

Public Health Defense Course. The Public Health Service and the U.S. Army Chemical Center and School will sponsor a 5-day course to provide training in chemical and biological defense. The program, designed for public health and medical personnel, will be offered October 10-14, 1966; also February 27-March 3, and May 22-26, 1967.

Although the course will be conducted at Fort McClellan, Ala., it is directed to civilian needs and security clearance of students is not required. Additional information and forms necessary for enrollment are available from the Deputy Chief, Training Branch, Division of Health Mobilization, Office of the Surgeon General, Public Health Service, Washington, D.C. 20201.

Nutrition Fellowships. Every year the French Nestlé Company and the Guigoz Company each award a fellowship of 12,000 francs to enable a physician to do research in nutrition for 1 academic year. An adequate knowledge of the French language is required, and fellows are expected to submit a paper on their work at the end of their term. Not later than December 31, 1966, applicants are requested to send to the International Children's Centre, Chateau de Longchamp, Bois de Boulogne, Paris 16, (a) a curriculum vitae, (b) a letter of introduction from a scientist with whom they have worked, and (c) an outline of the studies they would undertake with the fellowship. The 1967-68 fellowships will be awarded in the spring of 1967.